Sheet 1,
3 Sheets.

J. P. Humaston.

Punching Paper for Telegrams.

No. 18,149. Patented Sept. 8, 1857.

Fig 1

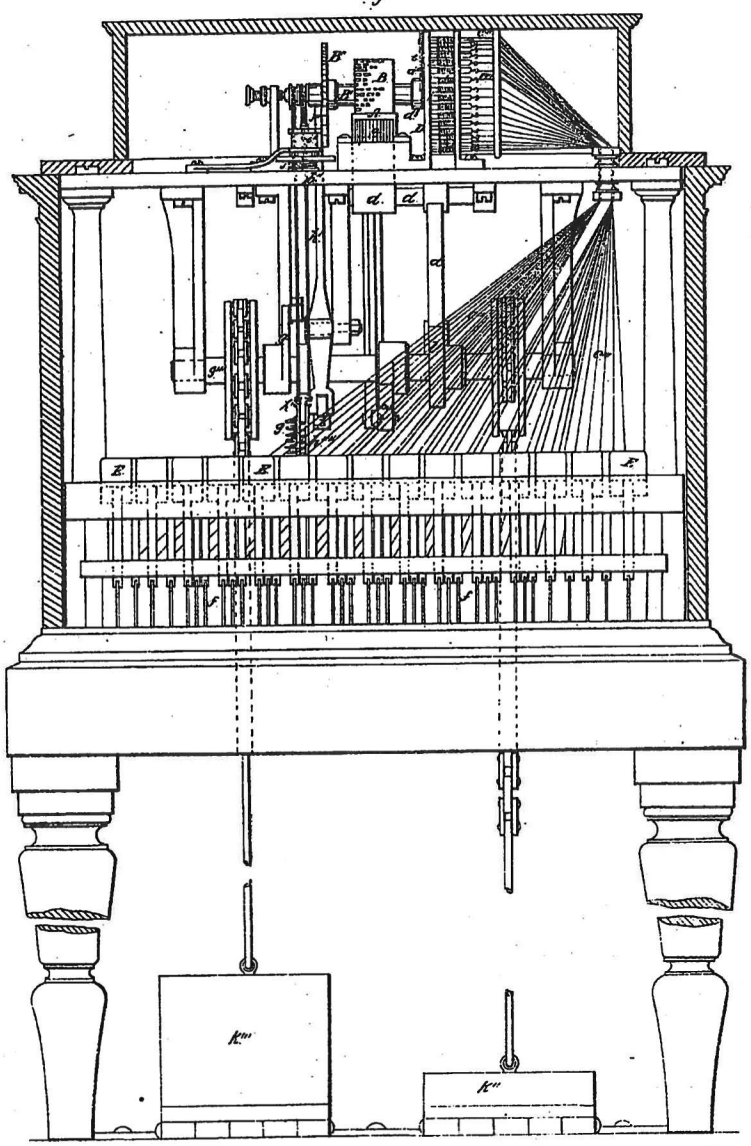

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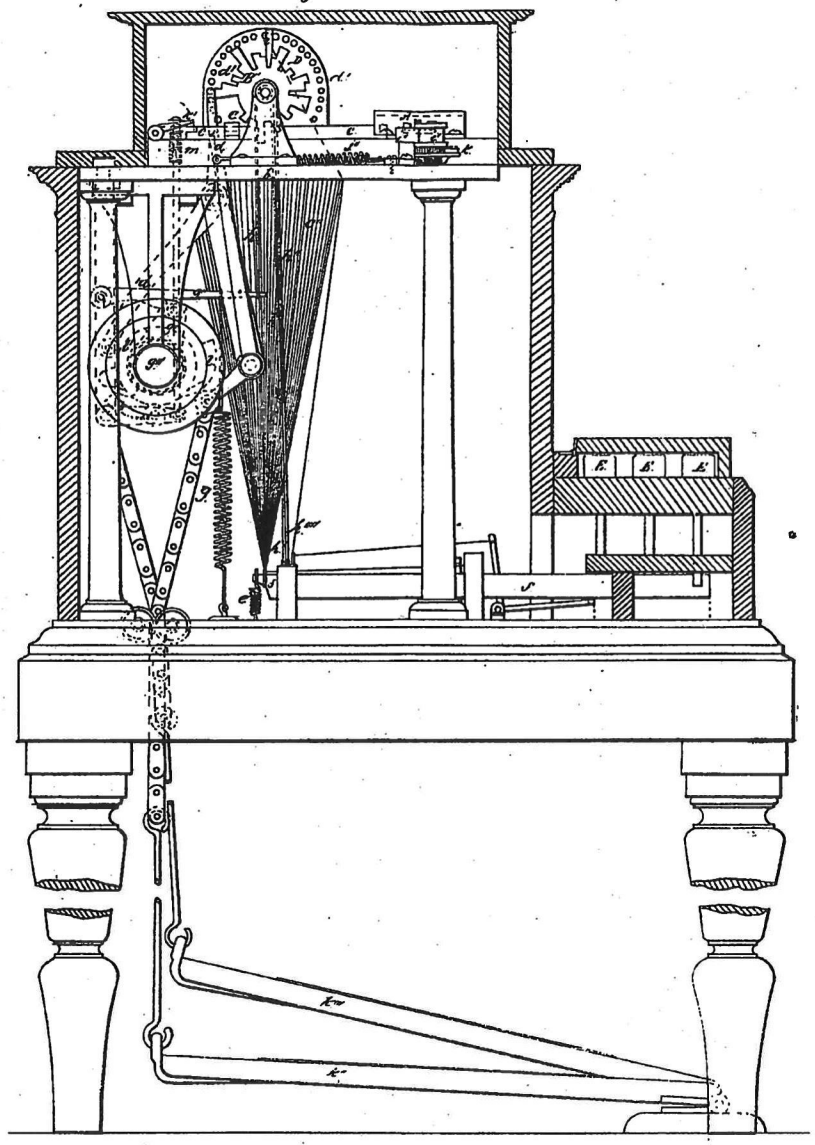
Fig. 2



Sheet 3,
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Fig 3.

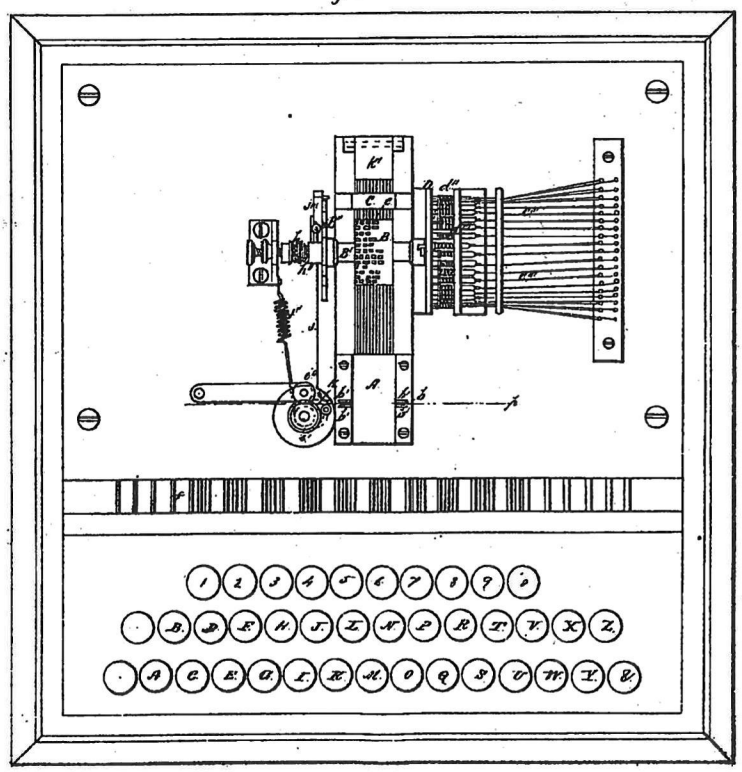


Fig 9.

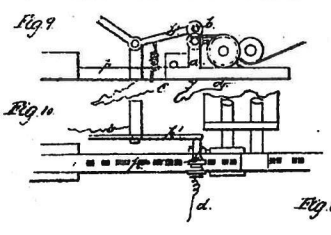


Fig 10.

Fig 8.

Fig 4.

Fig 5.

Fig 6.

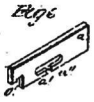
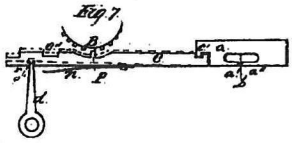


Fig 7.



UNITED STATES PATENT OFFICE.

J. P. HUMASTON, OF NEW HAVEN, CONNECTICUT.

IMPROVEMENT IN MACHINES FOR PUNCHING PAPER FILLETS FOR TRANSMITTING TELEGRAPHIC SIGNALS.

Specification forming part of Letters Patent No. **18,149**, dated September 8, 1857.

To all whom it may concern:

Be it known that I, JOHN PIERREPONT HUMASTON, of New Haven, county of New Haven and State of Connecticut, have invented certain new and useful Improvements in Telegraphing; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being made to the annexed drawings, making a part of this specification, in which the figures are fully referred to and described herein—that is to say—

This invention is for certain improvements in electric telegraphs of the recording kind; and it consists in a machine termed a "telegraphic compositor," the use of which is to prepare beforehand, upon slips of paper or other suitable material, the matter it is desired to transmit, and this paper is to be passed through the telegraphic transmitting-machine, wherein it effects the breaking and the closing of the circuits in accordance with the characters or signals to be conveyed, and is in lieu of the hand of the operator in the old mode.

The chief object sought to be accomplished is to increase the quantity of matter which may be sent over a line, and which quantity it is manifest is only limited by the velocity of the electric current and the capability of the machine by which the circuits are closed and broken. When an operator, by his finger, breaks and closes the circuit for the transmission of a message, the limit is his ability to write the message.

The principle I adopt has already been proposed, and consists in punching holes in a strip of paper in the order and shape necessary to form the required characters on the recording-machine at the opposite end of the line of wires; and my improvement is in constructing a machine for rapidly composing any message to be transmitted on this plan. This composition may consist of perforations, as above mentioned, or by printing or affixing upon the fillet of paper some substance which will operate to break and close the electric conductors in an equivalent manner. I prefer, however, to make the characters by perforations in the paper. These perforations are made by a set of cutting-punches, so arranged in the machine that by indicating the letter or character to be made upon a finger-key, a hole or set of holes and spaces, of the proper shape for that purpose, can be punched simultaneously through the fillet of paper placed in a direction to receive it.

Figure 1 of the drawings hereunto annexed represents a front view, Fig. 2 a side view, and Fig. 3 a plan, of this machine. Fig. 4 represents a section of the punches through the line *x x* of Fig. 5, and Fig. 5 a longitudinal view of the same. Fig. 6 is a perspective view of one of the punches detached, those being indicated by the letters *a*. These punches are flat pieces of metal of the shape shown, and cut out on the under sides so as to leave two ends, *a'* and *a''*. The fillet of paper passes in the space *b* between the two ends.

The alphabet I shall describe as being made by my machine consists of dots and dashes, and a movement of a single punch from *a'* in the direction of *a''* will make a dot; and two or more punches moving side by side will make a slot or dash of greater or less length.

The number of punches is such that they can be moved so as to form the various combinations of dots and dashes for the alphabet and the nine numerals.

The punching of each letter or number is performed by two operations. The first is effected by the touch of a key marked with the letter or sign to be made, and which brings into position as many and such of the punches as are required to be moved, in order to perforate the paper for that sign; the second moves the punches and feeds the paper along to be in readiness for the next letter, &c. This is accomplished by means of a series of links, connected with the punches, a certain number of which are brought into play whenever a key is touched. These links lie horizontally on the top of the machine, and is shown at *c* in Fig. 3. The punches lie under the box A; Figs. 1, 2, 3, and their ends are attached by a hook to a like hook. (Shown at *c'*, Figs. 5 and 7.) Each link has a spring, *n*, Fig. 7, under it, which tends to force it upward, and is intended to raise the end which is free. Near that end a notch, *s'*, is cut in each link *c*, so that the notches of all shall be in a line, into which line of notches the end of a broad, flat lever fits. (Shown by the dotted lines *d*, Fig. 2.) If that lever were moved forward all the punches would also be driven along, and the result would be the cutting of a long slot in the pa-

per equal to the entire length of the combined width of the punches. If, now, every alternate link be allowed to rise to a distance equal to the depth of the notches *s'*, then another movement of the lever *d* would move every alternate punch, the result being the cutting of a series of dots, and in this way the movements can be variously combined as may be desired. To effect this two things are requisite. The first is to bring into play some mechanism which shall indicate which and how many of the links *c* are to be actuated by the lever. The second is the proper feeding of the paper, because this latter requires to be very irregular, a single dot being required for only one of all the letters, while dashes and dots may be necessary to form the next one, and thus more or less space is required for each letter.

Each sign for the letters of the alphabet and the numerals is formed upon the face of a broad wheel, B, a diagram of which is seen in Fig. 8, and the same as if wound around the wheel B, Figs. 1 and 3. These signs are projections above the general face, and the latter wheel lies directly over the row of links *c*, as seen in Fig. 3, and is capable of revolving on an axis. Now, it is so arranged, that the letter-wheel will permit only such links to come into play as will accord with the letter which happens to stand directly over them, since there are projections P, Fig. 7, on the links, which strike against any projections that may be opposed on the letter-wheel. Where these interfere, such links are kept down, while the others may rise up by the force of their springs and get clear of the lever *d*, Fig. 2, thus escaping action; while the others will propel the punches necessary for cutting out the proper character. The links have also formed in them notches *c''*, Fig. 7, on their upper edges, which, when they rise to get clear of the lever *d*, clasp the upper part of the yoke C, Figs. 2 and 3, which spans them, and are prevented by it from being pushed forward by friction or otherwise. The cutting-faces of the punches which are thus held at rest, form, as it were, dies for the moving-punches to cut against in passing between, while slotted plates *b'*, shown in Figs. 4 and 5, form dies across which the upper and lower edges of the moving-punches pass in punching out the paper.

To bring the proper letter round on the letter-wheel B: At D, Figs. 1, 2, and 3, is a standard or plate, which forms one of the bearings for the axis of B. In a circle through this a series of holes is made, as at *d'*, Fig. 2, this series comprising as many holes as there are characters on the letter-wheel. Through each hole there is a pin, supported in a horizontal direction, as at *d''*, Figs. 1 and 3, a small spiral spring, *d'''*, on each tending constantly to force them through the standard D. Each pin has a cord, *c'''*, attached and leading to a key-lever of the finger-board, as at *f*, Figs. 1 and 2, E, Figs. 1 and 2, being keys of the said board. A spring at the end of each key overcomes the force of that on *d''*, so that all the pins are kept withdrawn with their ends flush with the face of D, except one which corresponds to the zero or blank space on the letter-wheel, this being so arranged as always to project when the others are withdrawn, and vice versa. On pressing down the end of a key the opposite end is raised, and slackening a cord, *c'''*, allows the pin to which it leads to project beyond the face of the standard D. Upon the axis of the wheel B a force tending to turn it round is produced, by the action of the spring *g* connected to the lever *g'*, which is raised by the crank-arm *g''* upon the shaft *g'''*, Fig. 2.

To the lever *g'* is attached one end of a piece of cord, *h*, which passes round the axis of the wheel B, and has its other end attached to a spring, *h'*, of less elastic power than the spring *g*. When the lever *g'*, after having been raised by the crank-arm *g''*, is drawn down by the spring *g*, the cord *h*, being passed round the axis of the wheel B, will turn that wheel rapidly round.

The wheel is prevented from rotating in the opposite direction by a piece of cord, *h''*, passed round its axis, and having one end attached to the frame-work of the machine at *h'''*, and its other end to a slight spring, *h''''*, which will yield when the wheel is moved, as before described, and allow the cord *h''* to slip upon the axis as it turns. Thus by means of an arm, *i*, on the axis placed, so as to be in range of the points of the pins *d''*, when the point of one of the latter projects, the further revolution of the wheel B will be arrested. Wherever the arm *i* is stopped, say, by a pin leading to key E, that letter will be the one on the wheel standing over the links. It is evident, therefore, that whatever key is touched, a letter or character will be brought into position to be punched by the subsequent operation of the machine.

The feeding of the paper is the next to be described:

The paper, as before mentioned, must be moved, after the punching of each letter, to a sufficient distance to bring a fresh blank space before the punches, and also to give the required space for distinguishing one letter from another, as well as the spaces between words and sentences.

The feed is performed by two rollers, *i' i''*, of which *i'* is on a fixed axis, *j'*, and the other is set up against it by a spring. The roller *i'* can play loosely on its shaft, and may be made to move round with the shaft only in one direction by means of a pawl, *k*, and ratchet-wheel, *i'''*.

A small chain or cord, *j*, passes round the shaft *j'*, terminating in a spring, *j''*, on the opposite side. The cord or chain *j* is attached to a long lever, *j'''*, and as this lever vibrates backward and forward it turns the shaft; but the drum *i''* will only be moved by the thrust of the pawl *k* on the ratchet *i'''* in one direction, and on the returning vibration of the

shaft the drum will be held firm by another pawl set on the frame, or simply by the friction of the roller on which the spring acts, while the first slips over the ratchet-teeth to take a new hold. Instead of this ratchet arrangement pieces of cord and springs, arranged as described with respect to the wheel B, may be employed to produce the necessary advance of the paper, the return of the drum being sufficiently prevented by the friction of i''. The paper will thus be fed constantly onward, the length of feed being according to the extent of vibration in the lever j'''. To govern this there is on the shaft B′ a graduated wheel or plate, B″, revolving with it, as represented in the Figs. 1, 2, and 3. The edges, it will be perceived, are notched out to irregular depths, and there are as many notches as there are sets of characters, and the notches are adjusted with reference to the position of those on the letter-wheel. These notches form a series of stops for the end of the lever j''', so that when it strikes against the one that projects the farthest out the motion will be shorter, and the feed of paper consequently least, and so on to the deepest notch required for the longest letter or character.

The end of the paper fillet being pushed through the plates b' into b, Figs. 3 and 5, a letter is formed as follows: Press down the key representing the required letter or number, as A, the proper pin, will be pushed out, the shaft B′ will fly round, by the force of the spring g, until arrested by its arm i striking the pin aforesaid. The proper character on the letter-wheel will now be in position to operate on the proper links c, which are to be kept in place. At this moment a clamp, k', Figs. 2 and 3, is raised by the action of the spring m under it, being made to turn when required by another cam, m', Fig. 1, on the shaft g''', which draws down the clamp against the force of that spring. This clamp is used to keep down all the tails of the links, but when raised all the links would be forced upward by the springs under them if the projections upon the letter-wheel B did not keep those down which are required to operate the proper punches. The others will rise and their notches s' get clear of the end of the lever d. By a pressure of the foot upon a treadle, k'', or k''', a cam, l, Figs. 1 and 2, is turned, which, first of all, permits the lever j''' to fly toward the index-plate B″, and gives the required amount of feed to the paper. A cam, l', then strikes the tail of the other lever, d, and drives forward all those punches which are kept in gear with the notches s'. The foot is then raised and the two levers are restored to their former points.

It must be understood that the key A was kept pressed down during the whole process, and until the key for the succeeding one is operated, when the process continues as before.

The punches, to perform the work well, should have a peculiar construction at the cutting-edges, for it will be understood from the foregoing description that when one or more punches move, the adjoining punches on each side, which remain stationary, perform a part, for they then act as the other half of a shears, the moving punches being the first half. The correct working of this part is very important, as upon the making of the perforations with well-defined lines and a perfect detaching of the cuttings depends the accuracy of the workings. I shall therefore give a separate description of their construction.

The best material is of some steel that will temper. The shape of each separate one is that of a thin plate, as seen at a, Figs. 4, 5, and in the perspective view, Fig. 6. There are two cutting-surfaces formed by the two ends, a' and a'', which edges are peculiar—that is to say, these ends, instead of being square, have a V-shaped cavity cut, thus forming an end with two sharp edges, as seen in Fig. 6. Furthermore it will be seen that these edges do not stand in the same position, the two edges of a' being formed by the top and bottom of the punch end, while in a'' the cutting-edges are parallel to the sides of the plates. These cutting ends are arranged in a long slot cut in two plates, b' b'', Figs. 3, 4, 5, between which the fillet of paper passes; and the width of the plates apart is the distance of the inner edges of the punches, so that when those punches are at rest the surfaces are all flush, as shown. The cutting-edge of a punch, which when moving is that of a', advances in the direction of the arrow, Fig. 5. The top and bottom of the hole is therefore cut by the top and bottom edges of a', shearing against the slot in the plate b'', while one edge, a'', of a punch on each side in connection with the V-sides of a' form the shears for the other sides of the hole, and accordingly a square hole is clearly cut out. If two or more adjoining punches move together the cutting-surface of a' is lengthened by the addition proportionately; and for the extreme outside ones the ends of the slot in plate b'' form the other half of the shears.

The fillet of paper thus prepared may be used for transmitting the message by means of a machine such as is shown in Figs. 9 and 10, of which Fig. 9 is a side elevation, and Fig. 10 a top view.

At a is a standard having a small drum, a', fitted at the top to rotate. These must be of metal or some conducting material for electricity. Immediately over this is a small roller, b, fixed to an arm, b', which is hinged to a post, as shown. This roller is made to press down upon the drum by a spring, as shown. The fillet p of perforated paper passes along over the drum, and is so guided that the roller b will travel in the track of the perforation, as seen in Fig. 10. The positive and negative wires are attached to these, one being seen at d and the other at e. The paper is to be drawn between the drum and roller with as much

speed as may be found practicable to record by the machine at the opposite end of the line. Whenever a perforation comes under the roller *b* the circuit of electric conductors is closed, and so continues until a blank space comes, when it is broken. This breaking and closing form characters in the usual way except as regards speed.

The operation may be varied in several ways without changing the character of my invention. Instead of punching or cutting holes in the fillet of paper, the punches may become a sort of printing-type to apply some conducting materials, by the movement of the ends, made of a suitable shape up to the paper, such as tin-foil; or if the fillet be made of a conducting substance, then the ends of the punches may apply to it a non-conducting material as a varnish, ink, or anything by which the breaking or closing of a circuit may be accomplished by characters impressed or affixed upon a traveling medium, such substantially as has been described; or the paper may be so fed as to pass under the letter-wheel, and that being formed like type, can be so operated as to give an impression directly to said paper.

I claim—

1. The manner of operating the punches for perforating the characters in the paper, consisting of the revolving type-wheel or other equivalent means of indicating characters, in combination with the punches, as described.

2. The method of regulating the feed of paper, consisting of the graduated stop-wheel or equivalent series of stops, in combination with the type-wheel and with the means for propelling the paper fillet past the punches, as described.

3. The manner of forming the cutting-ends of the punches—that is to say, having its advancing end formed into two cutting-edges by means of the V-shaped recess, in combination with a second pair of cutting-edges opposite to them, formed in like manner and upon the same plate, but in position at a right angle to the first pair, thus making the other half of the shear in conjunction with an adjoining punch, substantially in the manner set forth herein.

J. P. HUMASTON.

Witnesses:
J. P. PINSSON,
S. H. MAYNARD.